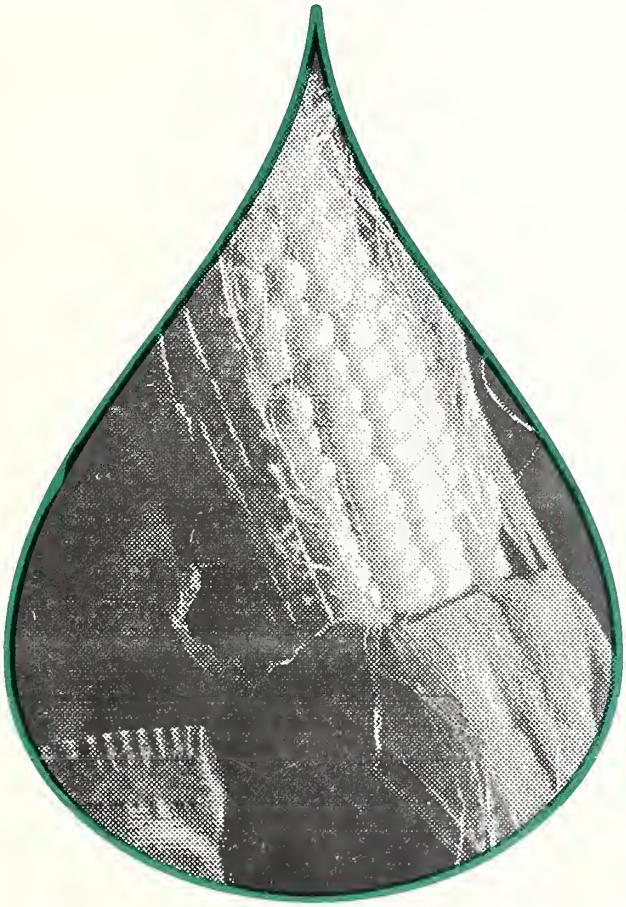
WATER QUALITY

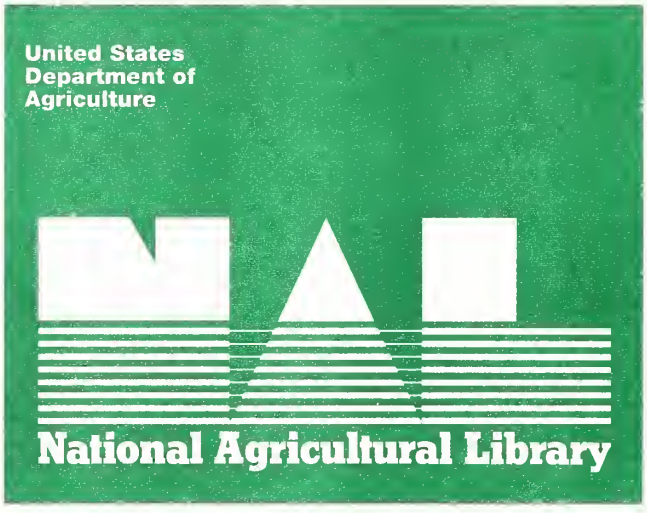
Mid-Nebraska Demonstration Project

1995

Field Demonstrations of Best Management Practices to Protect Ground Water Quality



Natural Resources Conservation Service
University of Nebraska Cooperative Extension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Under the leadership of the Natural Resources Conservation Service and the University of Nebraska Cooperative Extension, the following agencies have provided financial and personnel assistance to make this project possible:

- Upper Big Blue Natural Resources District
- Tri-Basin Natural Resources District
- Little Blue Natural Resources District
- Lower Republican Natural Resources District
- Blue River Association of Groundwater Conservation Districts
- UNL Conservation and Survey Division
- USDA Agricultural Research Service
- USDA Farm Service Agency
- Nebraska Department of Environmental Quality

PROJECT PERSONNEL

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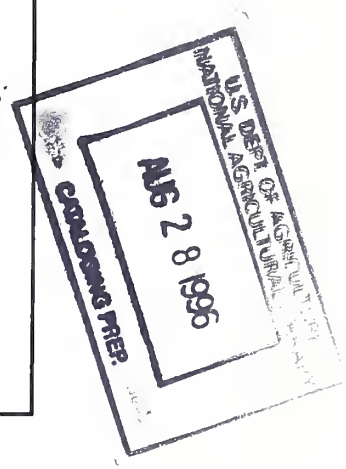

94-EWQD-1-9517

Project Committees:

Little Blue Natural Resources District Project Committee

Lower Republican Natural Resources District Project Committee

Tri-Basin Natural Resources District Project Committee

Upper Big Blue Natural Resources District Project Committee

Special Thanks to:

Dean Krull
Platte Valley Nitrogen and Irrigation Management Demonstration Project

Kelly Wertz
Management Systems Evaluation Area

Greg Craig
Little Blue Natural Resources District Project Committee

Ron Wunibald
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Rick Anderbery,
Tri-Basin Natural Resources District Project Committee

Rod De Buhr
Upper Big Blue Natural Resources District Project Committee

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Individual Plot Data, Alphebetically

Mid-Nebraska Water Quality Demonstration Project

The Mid-Nebraska Water Quality Demonstration Project (MNWQDP) began in 1990 under the authorization of USDA funds from the 1990 Water Quality Initiative. The project has four objectives:

- Foster adoption of farm management practices that will reduce nutrient and pesticide loading in the soil
- Promote producer adoption of irrigation management practices that provide adequate moisture to grow crops while reducing leaching of agricultural chemicals to ground water
- Demonstrate that producers can achieve suitable economic returns while utilizing management practices that reduce inputs and chemical leaching to ground water
- Effectively address critical water quality issues in Nebraska by integrating resources and expertise from agribusinesses, and government and educational institutions.

Project Description

The 17-county area encompassed by the MNWQDP contains over four million acres of cultivated land that has been irrigated for more than 60 years. Continuous corn production is the most common agricultural practice on most of the irrigated acres. Investments made in irrigation capabilities and USDA farm program provisions strongly influence cropping decisions in this area.

The production area includes some of the most productive corn producing acres in Nebraska. While the area accounts for less than 22 percent of the cultivated acres in the state, it produces 35 percent of the total corn acres and it accounts for over 30 percent of the nitrogen fertilizer farmers use.

This production history has left many areas of South Central Nebraska with a high nitrate concentration in the vadose zone (the area between the root zone and the water table). As nitrate reaches the ground water, community and private wells may become contaminated.

A critical widespread nitrate problem in the ground water underlying the project area does not currently exist, but the intensive irrigated agricultural practices in south-central Nebraska create the potential for water quality problems. As the project began in 1990, evidence from local, state and federal agency studies showed that ground water levels were on the rise and a nitrate load does exist in the vadose zone. Most of the nitrate is at depths that deep-rooted crops cannot reach, which lead it to eventually leach into the ground water.

Project Structure

The project area includes four of Nebraska's natural resources districts (NRDs), the Little Blue, the Lower Republican, the Tri-Basin and the Upper Big Blue. In 1995, project personnel developed a stronger working relationship with NRD personnel to match project goals with best management practices emphasized in each NRD.

Early indications regarding the strengthened relationship between the MNWQDP and the NRDs are positive.

"The new cooperative concept, adopted by the Mid-Nebraska Demo Project in 1995, worked very well for Tri-Basin NRD," said Richard Anderbery, Tri-Basin NRD water quality coordinator. "All local agencies involved worked together to develop greater interest and better attendance at all tours... [W]e had a very successful year."

"I have talked with numerous farmers while doing field work and the consensus is the [Mid-Nebraska] Project has educated them in relation to recommended applications of nitrogen, irrigation flow meters and other innovative practices such as GIS," said Greg Craig, water resources manager of the Little Blue NRD. "The Mid-Nebraska Demonstration Project's name is now commonplace with better irrigation technology among a long list of BMPs. I will continue to support the Mid-Nebraska Demonstration Project."

Best Management Practices

The Mid-Nebraska Project team encourages producers to employ 19 Best Management Practices (BMPs) to slow nutrient and pesticide movement from the crop root zone to ground water. The project focuses on three areas:

Nitrogen BMPs

Nine practices promoted through the Mid-Nebraska project help reduce nitrate loss to ground water.

1. **Select a realistic yield goal**
2. **Credit irrigation water nitrate**
3. **Credit legume nitrate**
4. **Credit soil nitrate**
5. **Credit manure, sludge or compost fertilizer nitrate**
6. **Efficiently apply manures, sludges and compost**
7. **Use nitrification inhibitors**
8. **Split-applying fertilizer**
9. **Plant a fall cover crop**

Irrigation BMPs

The project team encourages six practices to keep irrigation systems operating efficiently, with no more water than necessary.

1. **Level land**
2. **Use reuse pits**
3. **Use a water flow meter to measure the amount of water applied**
4. **Schedule irrigation based on crop water use**
5. **Use surge irrigation**
6. **Rotate crops**

Pesticide BMPs

Pesticides are not a major problem in ground water in South Central Nebraska. Atrazine is the only pesticide occasionally found at low levels in wells. These four practices prevent contamination and tighten economic management.

1. **Rotate Crops**
2. **Properly mix chemicals**
3. **Practice Integrated Pest Management (IPM)**
4. **Effectively apply chemicals**

Reference Aids

Several publications and software resources are available through local cooperative extension to help producers implement the BMPs recommended under the MNWQDP.

Nitrogen Management

Neb Guides

G74-174A	*Fertilizer suggestions for corn (rev. July 1995)*
G77-361	*Using Starter Fertilizer for corn, grain sorghum and soybeans*
G93-1171A	*Using a chlorophyll meter to improve N management*
G94-1178A	*Fertilizer nitrogen best management practices*
G91-1000	*Guidelines for soil sampling*

Other Extension Publications/Software

SOIL TEST,	*version 4.93: fertilizer recommendation software*
EC94-737D	*Calibrating anhydrous ammonia applicators*
EC93-126D	*Procedures for field demonstrations of nitrogen management practices*
EC89-117	*Fertilizing crops with animal manure*

Irrigation Management

Neb Guides

EC89-723	*Irrigation scheduling using soil moisture blocks in silty soils*
NF94-176	*Surge irrigation*
NF94-177	*Nebraska surge irrigation trials*
NF94-178	*Surge irrigation field layouts*
NF94-179	*Surge irrigation management*
G78-392	*Selecting and using irrigation propeller meters*
G78-393	*Water measurement calculations*
G85-753	*Irrigation scheduling using crop water use data*
G91-1021	*Managing furrow irrigation systems*

Other Extension Publications/Software

CP13	*Furrow Irrigation Toolkit (software evaluating and fine-tuning furrow irrigation systems*
EC91-735	*The impact of nitrogen and irrigation management and vadose zone conditions on ground water contamination by nitrate-nitrogen*
G84-690	*Estimating soil moisture by appearance and feel*

Pest Management

Neb Guides

G75-217	*European corn borer*
G77-382	*Right crop stage for herbicide use*
G79-471	*Choice of corn hybrids*
G81-613	*Ear attacking insects of corn*
G86-774	*Western corn rootworm soil insecticide treatment based on beetle numbers*
G87-839	*Corn rootworm control*
G89-904	*Corn insects - quick reference*
G91-1031	*How to hire a crop consultant*

Other Extension Publications

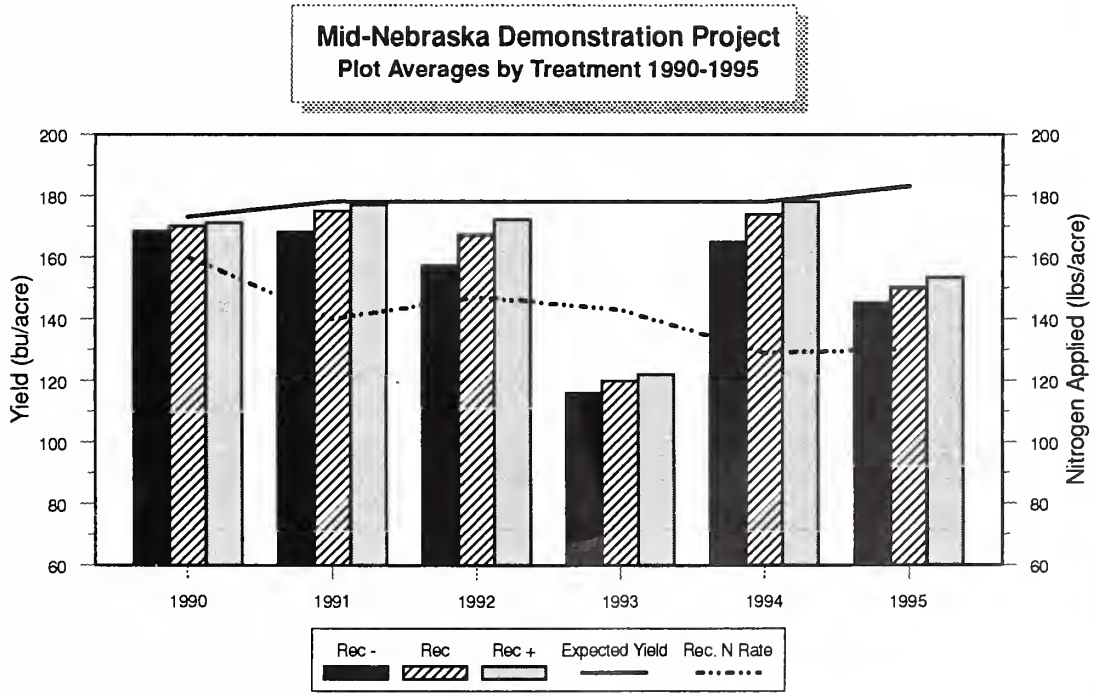
EC91-130	*Herbicide use in Nebraska—guide*
EC92-1509	*Insect management guide for Nebraska corn and sorghum*
EC92-1511	*Insect management guide for Nebraska alfalfa, soybeans, wheat, range and pasture*

Summary of Results - 1995

Once again Mother Nature dealt a blow to yields in South Central Nebraska in 1995 even though plant stands were quite adequate. Most demonstration sites had stands of 25,000 to 28,000 plants per acre. A cold, wet spring and hot, dry summer were not conducive to raising a bin-busting corn crop. With 109 years of weather data in Nebraska, this was the fifth shortest growing season on record. The growing season was shortened at the beginning by delayed planting and cold soils, and at the end by a killing freeze on September 22. One site was destroyed by hail.

Nitrogen Management

Sixteen sites compared University of Nebraska recommended nitrogen rates against higher and lower rates in 1995. The recommended rate was statistically equal to the high rate at 14 sites. While there was no statistical difference, the high rate was numerically greater on 13 sites. The expected yield was not reached on any of the 16 sites. Therefore, nitrogen likely was not the limiting factor (see the table on pages 12 and 13). In fact, the average recommended rate yield of 150 bushels per acre was 36 bushels below the average expected yield of 186 bushels per acre.



The above graph shows the effect of weather and the risks associated with strict nitrogen management during the length of this project.

The most obvious weather effect was the wind damage of 1993, reducing yields by 50 bushels or more. In 1994 10 of 14 fields fell 10 bushels or more short of their 1994 expected yield because of wind damage. Extra nitrogen did not help any of the 14 fields reach the expected yield. Damaged or destroyed crops did increase the soil nitrogen shown by 1994's decreased recommended rates to only 129 pounds per acre on average. The opposite occurred after the wet year of 1992; only 48 pounds of nitrate were left in the four-foot soil profile.

Hail and frost were big problems in 1992, as well as excessive rain. Yields on 13 fields were below the expected yield that year by 10 bushels or more. Two suffered hail damage and six showed nitrogen deficiency due to denitrification and nitrogen leaching. Only one of the fields came close to the expected yield with the high rate of nitrogen. Nitrification inhibitors and split application would likely have paid dividends on those fields in 1992. Six years of field data show the risk from fine-tuning nitrogen management is very small. Using the University of Nebraska approach of crediting soil, water, manure, legumes and organic matter results in yields within three bushels of a higher rate of nitrogen. Even deliberately-underfertilized plots have still been within 15 bushels of the high rate after continuous treatment for six years.

Irrigation Water Management

Twenty-one of the 28 cooperators used in-line flow meters in 1995. The meters are an essential tool for water management and troubleshooting irrigation systems. All sites also used an ultrasonic flow measuring device to verify flow rates. An added advantage of the ultrasonic device is the ability to measure flow losses from leaky gates and gaskets in a gated pipe, gravity irrigated situation.

The goal of irrigation scheduling is to utilize as much soil water as possible without excessive crop stress, giving the maximum opportunity to hold and use rain water.

In 1995, cooperators scheduled irrigation based on crop water use estimates and soil moisture deficits. In most fields, consultants estimated deficits using the hand-feel method.

Individual site reports show the water status of the root zone. The irrigation graph from Chris Erickson's site (page 37) is a good example of scheduling for a 50 percent soil moisture deficit. Chris's first two irrigations occurred near the minimum depletion threshold. He utilized the sparse rainfall before his third application. His next application was once again near the minimum depletion threshold with the last irrigation timed just right for a 60 percent depletion, giving sufficient moisture to take the crop to maturity.

WATER QUALITY

Mid-Nebraska Demonstration Project

The project staff would like to thank the following cooperators for providing demonstration sites in 1995:

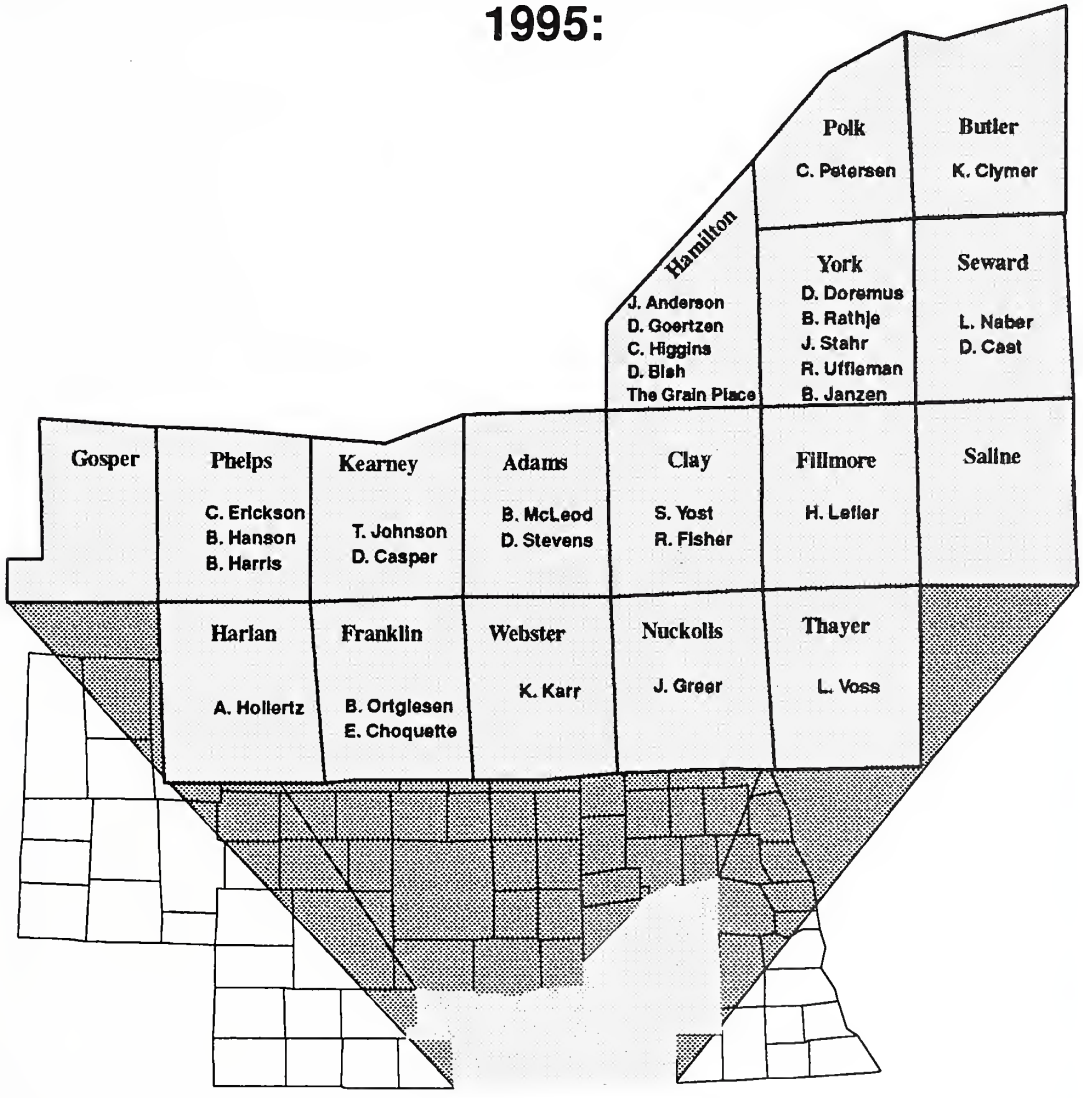


Table 13. Summary of practices and results from all the 1995 demonstration sites.

Site	--Used in N rate recommendation-- Yield Goal bu/acre	Residual Soil NO3-N lb/acre-3ft	--Measured during season-- Gross Rainfall inches	Gross Irrigation in/acre	Water NO3-N Content ppm	Gross Water N Applied lb/a	Nitrogen Rate lbs/acre	Yield bu/acre
Anderson, Joel	NA	NA	10.30	2.85	6.20	4.36	NA	NA
Bish, Deryl	NA	NA	10.30	9.60	3.40	0.00	NA	NA
Casper, Dean	175	32	10.30	13.43	< 1.0	0.00	150R 175 200	146.7 b 147.1 b 157.8 a
Cast, Doug	NA	NA	9.90	13.24	10.20	30.39	NA	NA
Choquette, Edwin	200	52	8.30	21.87	6.20	30.51	0 50R 100	166.7 a 157.7 a 164.5 a
Clymer, Kent	NA	NA	7.25	11.40	< 1.0	0.00	NA	NA
Doremus, Dave	NA	NA	7.40	9.06	10.60	21.61	NA	NA
Erickson, Chris	NA	NA	7.79	11.00	4.20	10.40	NA	NA
Fisher, Ross	200	125	8.30	NA	2.80	0.00	55 105R 155	143.0 b 152.6 a 153.2 a
Goertzen, Deon	190	NA	10.30	17.85	6.60	26.51	110 160R 210	125.2 b 132.3 ab 140.4 a
Hanson, Bill	180	32	13.90	13.98	2.00	6.29	110 160R 210	158.3 b 166.0 a 164.9 a
Harris, Bill	175	136	11.49	35.76	< 1.0	0.00	40 75R 110	125.9 b 128.5 b 136.4 a
Higgins, Clayton	170	61	10.35	13.04	4.60	13.50	75 125R 175	120.1 b 134.5 ab 146.8 a
Janzen, Brian	170	53	7.85	29.66	3.30	22.02	80 130R 180	137.5 a 148.9 a 145.7 a

[1]Yields with the same letter are not significantly different at the 5% level of significance using Duncan's Multiple Range Test

R=Recommended Rate

NA=Not Applicable

Site	--Used in N rate recommendation--		--Measured during season--				Nitrogen Rate	Yield
	Yield Goal	Residual Soil NO3-N	Gross Rainfall	Gross Irrigation	Water NO3-N Content	Gross Water N Applied		
	bu/acre	lb/acre-3ft	inches	in/acre	ppm	lb/a	lbs/acre	bu/acre
Johnson, Tim	190	46	5.65	18.92	< 1.0	0.00	115 165R 215	142.3 b 146.6 ab 151.3 a
Karr, Kevin	175	43	10.95	8.34	2.00	3.75	100 150R 200	156.5 b 163.7 ab 167.4 a
McLeod, Bill	NA	NA	13.65	12.23	6.80	18.71	NA	NA
Naber, Larry	190	71	5.10	21.17	3.20	15.24	65 115R 165	151.0 a 144.5 a 147.1 a
Peterson, Colin	NA	NA	5.90	9.31	4.70	9.85	NA	NA
Rathje, Brad	200	104	6.75	NA	< 1.0	0.00	65 115R 165	145.4 b 155.0 a 158.9 a
Slepicka, Leland	NA	NA	5.50	NA	4.30	0.00	NA	NA
Stahr, Jerry (gravity)	185	57	4.75	21.54	7.00	33.93	70 120R 170	150.6 b 160.9 a 159.7 a
Stahr, Jerry (pivot)	185	54	5.25	13.65	6.00	17.63	80 130R 180	169.8 b 177.4 a 179.5 a
Stevens, Dan	190	69	10.77	17.81	1.50	6.01	105 155R 205	132.8 a 134.8 a 139.2 a
Uffelman, Ron	200	61	6.75	NA	NA	0.00	105 155R 205	166.4 b 172.6 a 172.8 a
Voss, Leroy	NA	NA	15.40	14.40	11.60	37.58	NA	NA

[1]Yields with the same letter are not significantly different at the 5% level of significance using Duncan's Multiple Range Test

R=Recommended Rate

NA=Not Applicable

Individual Demonstration Plot Data Summaries

William McLeod, Adams County

Dan Stevens, Adams County

Kent Clymer, Butler County

Ross Fisher, Clay County

Steve Yost, Clay County (rotated to soybeans in 1995)

Howard Lefler, Fillmore County (rotated to soybeans in 1995)

Edwin Choquette, Franklin County

Butch Ortgiesen, Franklin County

Deryl Bish, Hamilton County

Deon Goertzen, Hamilton County

The Grain Place, Hamilton County

Clayton Higgins, Hamilton County

Al Hollertz, Harlan County (rotated to soybeans in 1995)

Dean Casper, Kearney County

Tim Johnson, Kearney County

John Greer, Nuckolls County (crop lost to hail in 1995)

Chris Erickson, Phelps County

Bill Hanson, Phelps County

Bill Harris, Phelps County

Colin Petersen, Polk County

Doug Cast, Seward County

Larry Naber, Seward County

Leroy Voss, Thayer County

Kevin Karr, Webster County

Dave Doremus, York County

Brian Janzen, York County

Brad Rathje, York County

Jerry Stahr, York County

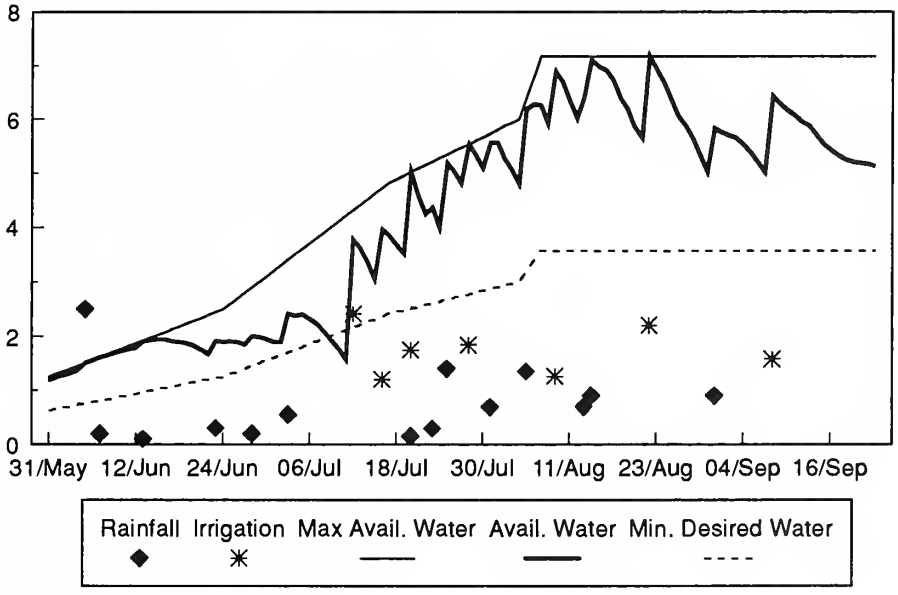
Ron Uffelman, York County

William McLeod, Adams County

- Location: 1 mile south and ½ mile east of Prossor
- Soil Type: Kenesaw silt loam with a 0-1% slope
- Preceding Crop: Corn

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Dan Stevens, Adams County

- Location: 5 miles south of Holstein
- Soil Type: Hord silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Disked
- Planting Date: May 14, 1995
- Hybrid: Fontanelle 5230
- N Application Type: 155 lb/acre anhydrous ammonia
- Herbicide: 1.2 qts/acre Bicep II, banded at planting
- Insecticide: 0.5 lb/acre Penncap-m, aerial applied, August 4, 1995
- Harvest Date: November 16, 1995

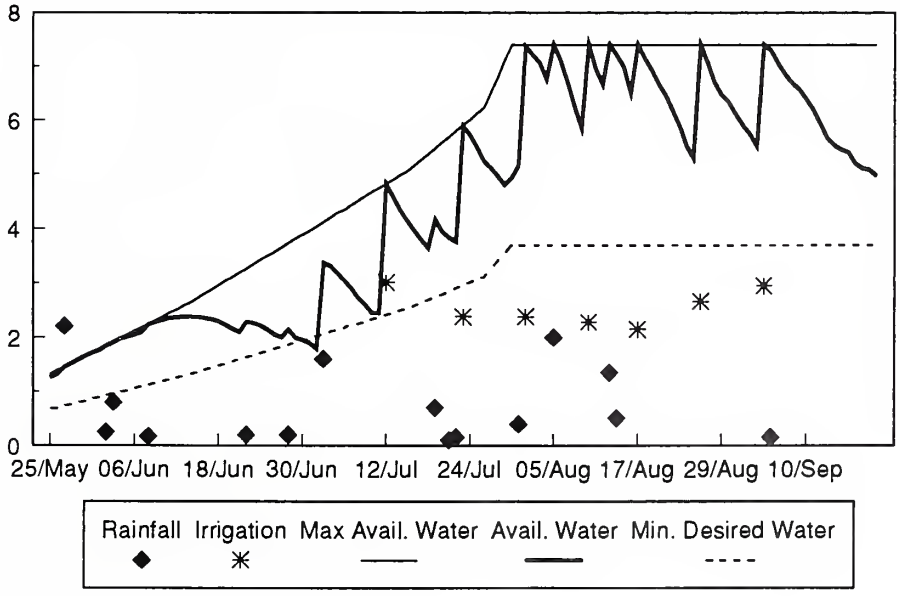
General Fertility	
pH	6.0
OM	1.8%
P	16 ppm
K	290 ppm
Zn	1.32 ppm

Nitrogen Management

Year	Treatment	Water N (lbs/acre)	Soil Residual N (lbs/acre)	Expected Yield (bu/acre)	N applied (lb/acre)	Yield (bu/acre)	5-year average Residual N	5-year average N applied	5-year average Yield
	-50				150	133	35	130	161
1995	Rec	3	69	200	155	135	64	180	167
	+50				205	139	57	230	168

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.

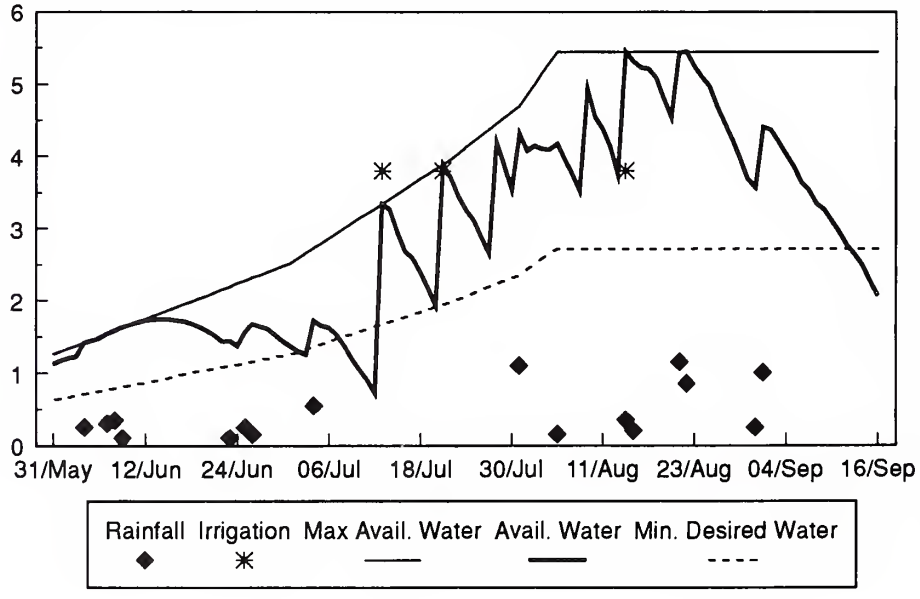


Kent Clymer, Butler County

- Location: 3 miles south and 1½ miles west of David City
- Soil Type: Butler silt loam
- Preceding Crop: Corn
- Preplant Soil Prep: Disked
- Planting Date: May 19, 1995
- Hybrid: Pioneer 3245 IR
- Starter: 9 gal/acre 8-20-5-izn-45, broadcast applied
- N Application Type: 150 lb/acre preplant anhydrous ammonia
- Herbicide: 1.5 lb/acre Atrazine, broadcast incorporated, 4 oz/acre Pursuit + 0.5 lb/acre Atrazine

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Ross Fisher, Clay County

- Location: ½ mile east of Clay Center
- Soil Type: Butler silt loam
- Preceding Crop: Corn
- Preplant Soil Prep: Shredded stalks
- Planting Date: May 21, 1995
- Hybrid: ICI 8543
- N Application Type 105 lb/acre anhydrous ammonia, April 4, 1995
- Herbicide: Harness Extra
- Insecticide: 6 lb/acre Counter CR, T-banded at planting
- Harvest Date: October 13, 1995

General Fertility	
pH	6.0
OM	2.7%
P	21 ppm
K	446 ppm
Zn	3.58 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	1-year average		
		(lbs/acre)	(lbs/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				55	143		55	143
1995	Rec	5	125	200	105	152	125	105	152
	+50				155	153		155	153

Edwin Choquette, Franklin County

- Location: 2 miles east and 4 miles south of the Upland corner on Highway 4
- Soil Type: Holdrege silt loam with a 0-3% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Chopped stalks, March 15, 1995
- Planting Date: May 14, 1995
- Hybrid: Pioneer 3225
- Manure Applied: Compost spread, January 1995
- N Application Type: 50 lb/acre anhydrous ammonia, sidedressed
- Herbicide: 0.67 oz/acre Accent, boradcasted
- Insecticide: 6 lb Counter, T-banded at planting
- Harvest Date: October 26, 1995

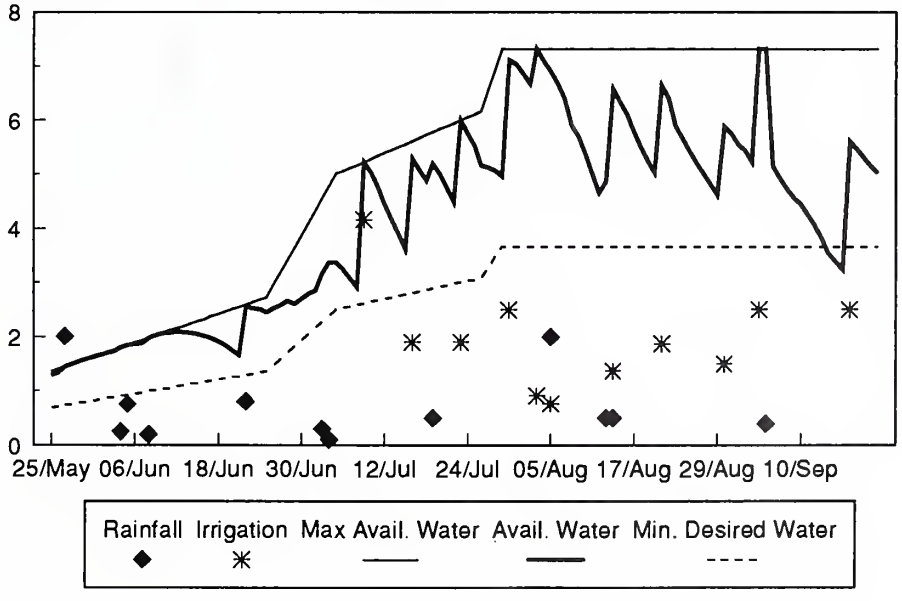
General Fertility	
pH	6.3
OM	2.5%
P	20 ppm
K	327 ppm
Zn	1.53 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	1-year average		
		(lbs/acre)	(lbs/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				0	168		0	168
1995	Rec	6	52	200	50	158	52	50	158
	+50				100	165		100	165

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Butch Ortgiesen, Franklin County

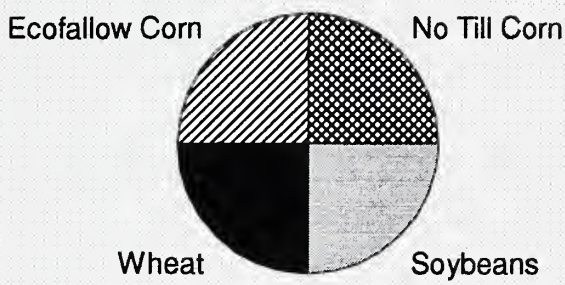
- Location: 7 miles south and 1 mile east of Wilcox
- Soil Type: Holdrege silt loam with a 0-1% slope

Special project—four crops under one pivot

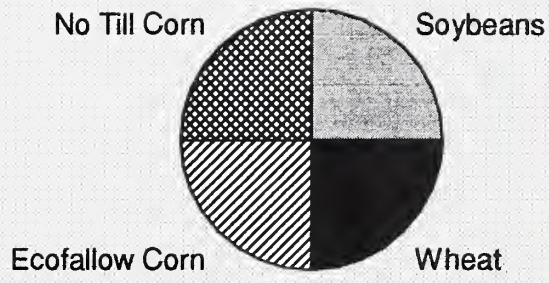
Butch Ortgiesen demonstrated a unique varied-crop, four-year rotation on a field with a low-pressure pivot which pumps 350 gallons per minute. The pivot, divided into four quarters, held soybeans, wheat, ecofallow corn and no-till corn. This site offered a good opportunity to demonstrate the advantages of crop rotation, irrigation management, fertilizer management and integrated pest management.

Butch will continue learning about and fine-tuning this cropping system to fully use management techniques that limit crop inputs and efficiently use resources.

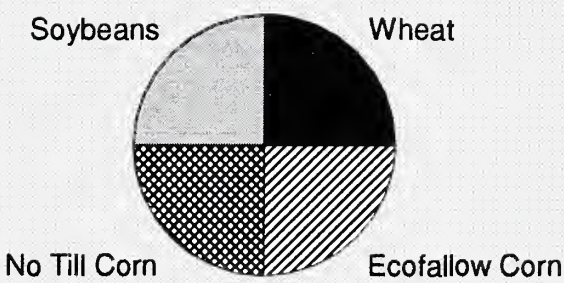
Diagram of crop rotation schedule



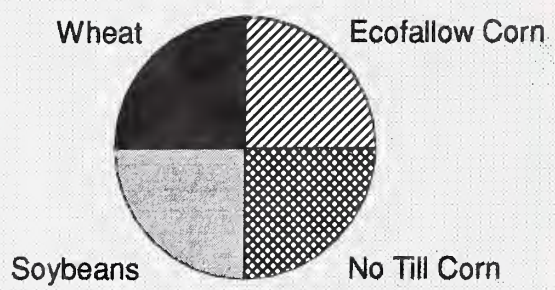
1995



1996



1997



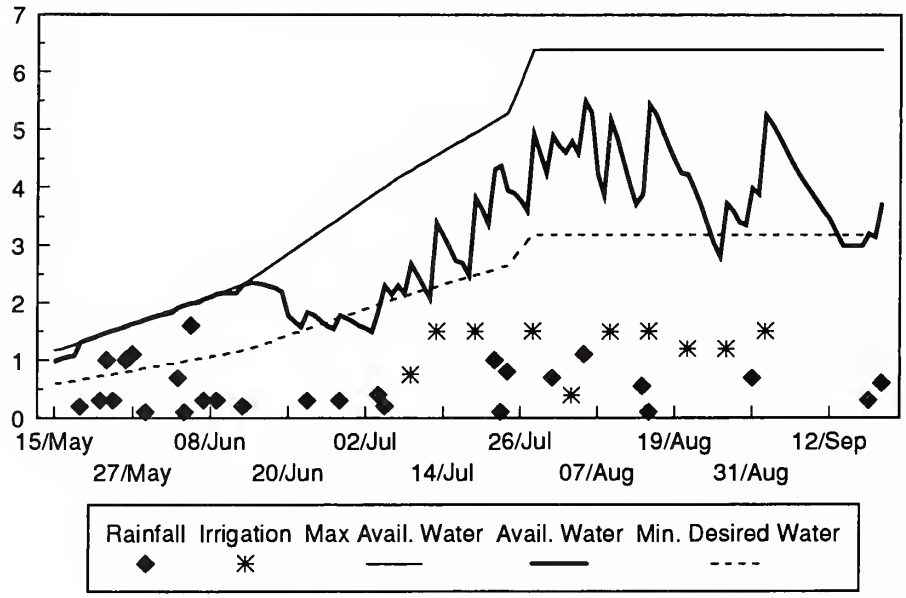
1998

Deryl Bish, Hamilton County

- Location: 4 miles west and ½ north of Giltner
- Soil Type: Hastings silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Rotary tilled, April 28, 1995
- Planting Date: April 28, 1995
- Hybrid: Golden Harvest H-2564
- Starter: 12 gal/acre 7-22-5, tilled in at planting
- N Application Type: 180 lb/acre anhydrous ammonia, October 1994
- Herbicide: 1 qt/acre Bicep, 1 pt/acre Atrazine at planting
  2.6 pt/acre Marksman, broadcasted, May 1995

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Special project—soil ripping in a pivot system

In 1994, Deryl Bish noticed some stunted plants. Using a spade to examine the root zone, Deryl noted signs of soil compaction. University literature suggests that there is little benefit to ripping fields that are irrigated and that dryland fields with compaction will most likely produce higher yields after ripping. Deryl decided to test the value of ripping on this center pivot-irrigated field by measuring soil bulk density, penetrometer readings and yield. He further tested to determine if a difference existed between fall ripping and ripping at cultivation.

The field had 3 treatments, randomly assigned. Deryl replicated the fall rip 5 times, with a control strip (no rip) and he replicated the spring rip 3 times. The results are shown in the table.

Deryl concluded that ripping had no affect on yields, which is consistent with the university literature mentioned above.

Measurment Type	Month	Fall Rip		Spring Rip		No Rip	
		Hard[1]	*Soft*	*Hard*	*Soft*	*Hard*	*Soft*
Bulk Density[3]	Nov.[2]	1.404	1.390	1.421	1.443	1.461	1.473
	June	1.432	1.434	1.466	1.436	1.439	1.475
Penotrometer[4]	Nov.	181.8	136.4	192.5	186.7	203.7	177.0
	June	135.0	127.8	104.4	100.6	133.4	131.0
Yield[5]		182.1 bu[a]		173.7 bu[b]		179.2 bu[ab]	

1 Bulk density samples were taken from one row where tire tracks repeatedly occurred (hard) and from 1 row having no tire tracks in the past 2 years (soft). The penetrometer readings were from an average of 2 hard rows per treatment and from the same soft row used for the bulk density readings

2 November measurements were taken after the fall ripping occurred. Therefore, the numbers in the November/Spring Rip field and November/No Rip field represent the field before ripping, while the fall ripped numbers show the effect of ripping. The June measurements were taken after the cultivation ripping

3 Bulk density is reported as grams/cm^3. It was measured at a 12-inch depth

4 Penetrometer readings are maximum dials readings on a penetrometer pushed to a depth of 18 inches

5 Yield was measured by a yield monitor first calibrated by comparing it to a weigh wagon.

a,b,c Yields with the same letter are not significantly different at the 5% level of significance using Duncan's multiple range test.

Deon Goertzen, Hamilton County

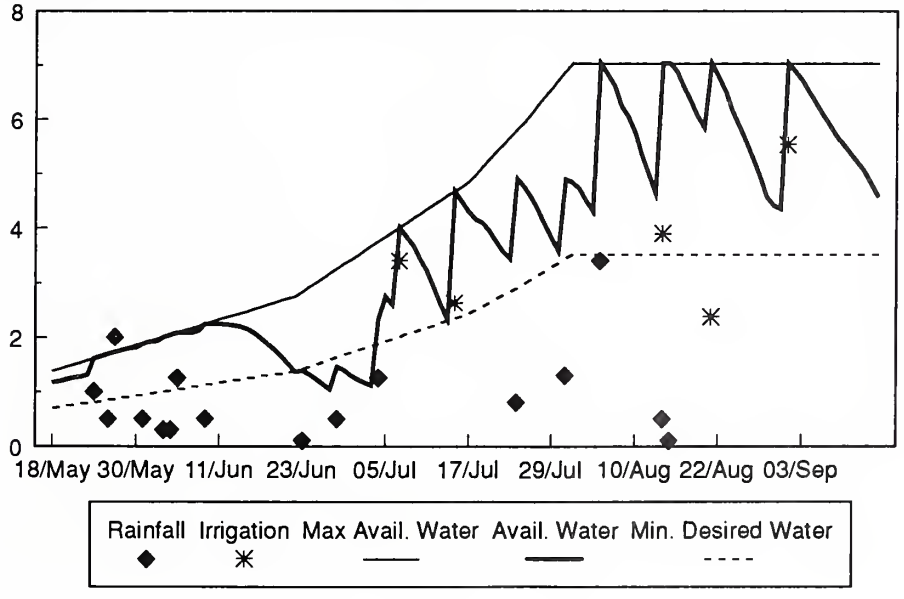
- Location: 1½ miles south of the I-80 Hampton exit
- Soil Type: Crete silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Disked
- Planting Date: April 28, 1995
- Hybrid: Vineyard 424
- Starter: 5 gal/acre 10-34-0
- N Application Type: 170 lbs/acre anhydrous ammonia
- Herbicide: 2 qt/acre Harness Extra, banded at planting
  Exceed, broadcasted, June 16, 1995
- Insecticide: 3 lb/acre Force at planting
  4 lb/acre Dipel at hilling
  1 pt/acre Penncap, August 1, 1995
  1 pt/acre Penncap August 15, 1995
- Harvest Date: October 19, 1995

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	5-year average		
		(lbs/acre)	(lbs/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				110	125	53	87	138
1995	Rec	13		190	160	132	90	137	149
	+50				210	140	120	187	157

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Clayton Higgins, Hamilton County

- Location: ½ mile west of Giltner
- Soil Type: Hastings silt loam with a 0-1% slope
- Preceding Crop: Corn
- Planting Date: April 28, 1995
- Hybrid: Fontanelle 4944
- N Application Type: 125 lb/acre anhydrous ammonia
- Herbicide: 1 qt/acre Bicep

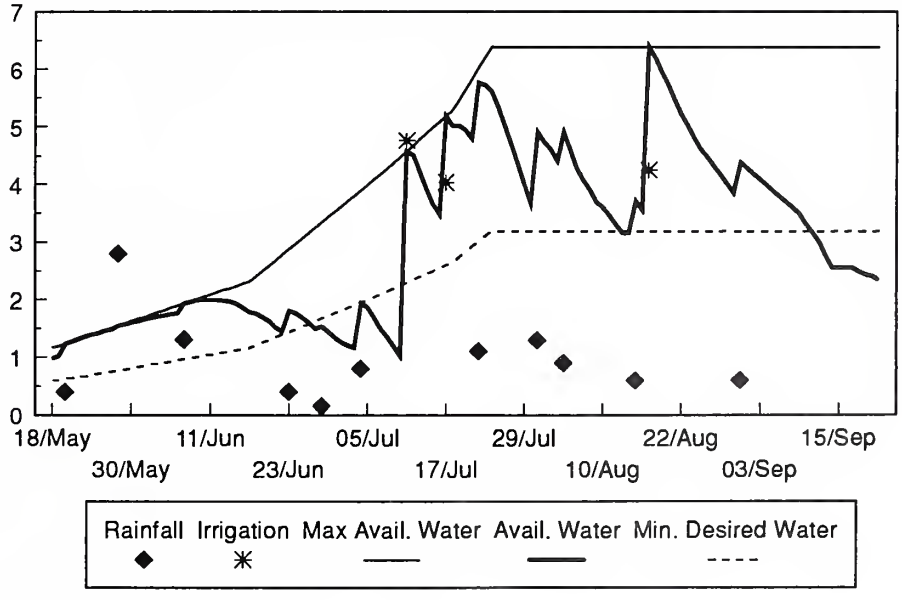
General Fertility	
pH	5.9
OM	2.5%
P	17 ppm
K	446 ppm
Zn	1.14 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	5-year average		
		(lbs/acre)	(lbs/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				75	120		79	139
1995	Rec	9	61	170	125	135	77	129	151
	+50				175	147		179	153

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.

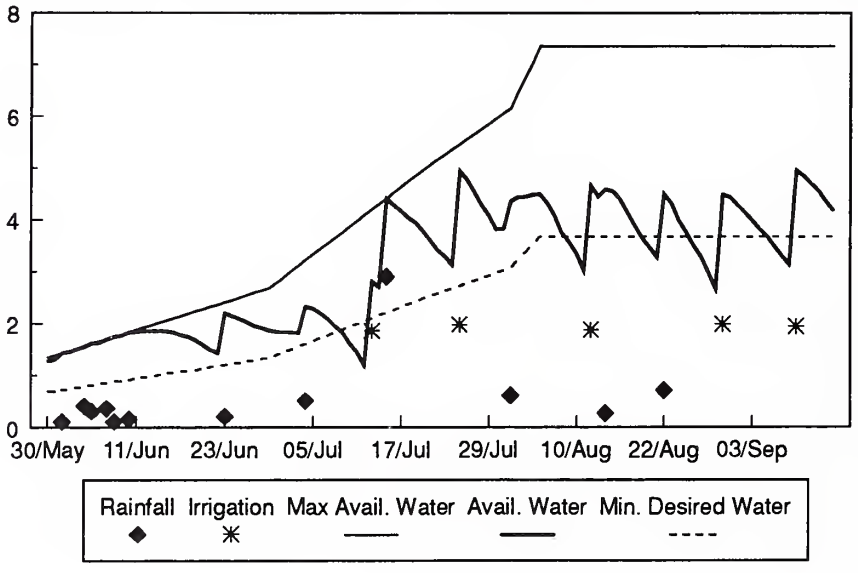


The Grain Place, Hamilton County

- Location: 5½ miles north of Aurora
- Soil Type: Holder silt loam with a 0-1% slope
- Preceding Crop: Soybeans
- Preplant Soil Prep: Disked and cultipacked
- Planting Date: May 16, 1995
- Hybrid: X715
- Starter: 0.75 gal/acre fish solution, 0.67 oz/acre sea kelp, 3.5 lb/acre cal-phos
- N Application Type: None
- Herbicide: None
- Insecticide: None

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Integrated Pest Management:

Field scouting on August 8, 1995 showed 1% European corn borer egg masses and .6 corn rootworm beetles per plant using the ear zone count. Predatory insects in the field included stink bugs, lady beetles and green lacewings. Other insect pests noted were grasshoppers and flea beetles.

Special project—organic corn production

The Grain Place produces Organic Crop Improvement Association (OCIA)-certified products. The OCIA forbids using most pesticides and commercial fertilizers, such as anhydrous ammonia.

The Grain Place uses extensive crop rotations and incorporates livestock into a systems approach to crop management. Rotations of plant types is important to the system. Grasses follow broadleaf plants and legumes. Sod forming species are included as well.

Nitrogen Management

Because many purchased inputs are not allowed under OCIA specifications, the goal is to maximize nutrient availability and supplement with approved products. The Grain Place relies heavily on legume crops of soybeans and alfalfa in the rotation to provide nitrogen. Some literature suggests sea kelp and fish products have beneficial products such as alginic acid. The Grain Place has used these products as foliar and seed applied treatments. They contain alginic acid, carotene, niacin, tocopherols, calcium, vitamin C, calcium and several trace minerals.

In 1995, Mike Herman, operator of the Grain Place, established a plot to determine if he could see any immediate effects of using sea kelp and fish products. Mike set out to measure several indicators of performance, which included yield, insect population in sticky traps, chlorophyll readings, yield potential (kernel sites per ear), disease incidence, insect feeding, Brix reading for plant sugar, and other nutrient contents of the grain.

Mike replicated his experiment five times using four treatments, including:

1. no fertilizer
2. a starter of 1 gal/acre fish solution + 2 oz kelp placed ½" below the seed
3. a foliar application of ½ gal/acre fish solution + 2 oz kelp applied at the 6- to 8-leaf stage
4. starter and foliar applications

Yields, chlorophyll readings, plant population and quality score are shown in the table. The subjective plant quality score was valued on a 1-to-5 scale where 1 was poor and 5 was excellent.

	No Fertilizer	Foliar fish/kelp	Starter fish/kelp	Starter + foliar
Yields (bu)	104.5	108.3	106.9	106.7
Chlorophyll	50.1	47.6	49.6	47.3
Plant Population	27,400	30,000	27,200	29,000
Quality score	3.8	3.6	3.6	3.6

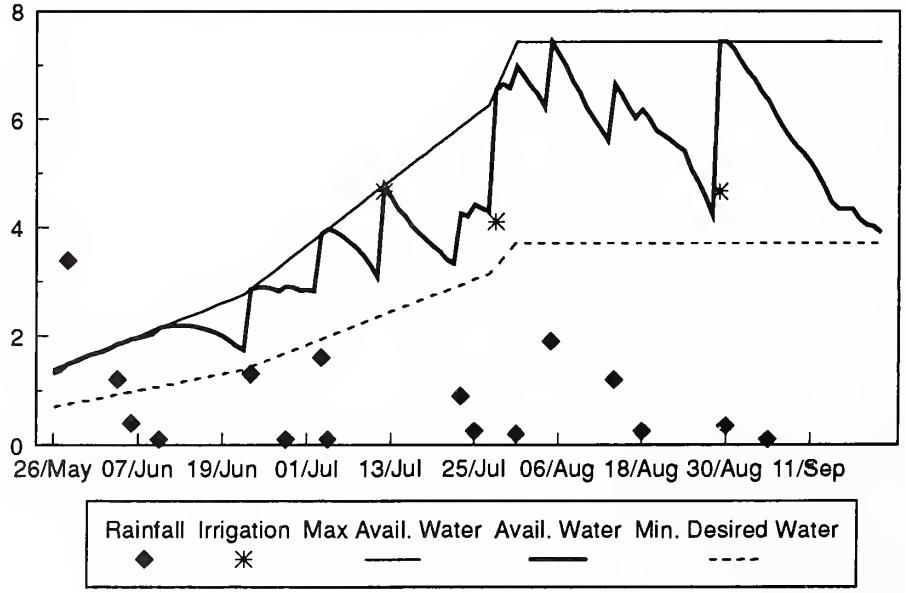
Dean Casper, Kearney County

- Location: 5 miles south, 3 miles west and ¾ mile south of Minden
- Soil Type: Holdrege silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Shredded stalks February 20, 1995
- Planting Date: May 15, 1995
- Hybrid: Pioneer 3417
- N Application Type: 150 lb/acre anhydrous ammonia, March 24, 1995
- Herbicide: 1 qt/acre Bicep/Round Up, banded at planting

General Fertility	
pH	6.5
OM	3.1%
P	22 ppm
K	512 ppm
Zn	.99 ppm

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Nitrogen Management

Dean Casper's field has had a significant difference in yield between the recommended rate ahd the +50 rates in four of the past six years. The average difference in yield has been nine bushels between the two rates. In the other two years, the yield was not significatnly different; the average yield difference was seven bushels between the two rates.

The University of Nebraska algorithm to determine nitrogen rates works on most fields, but some fields do not produce the usual yield result. In an effort to fine-tune the algorithm on Dean's field, he applied a recommended rate of 150 pounds of nitrogen, and a +25-pound rate (instead of the usual -50-pound rate) and a +50-pound rate. Dean will continue using these rates in 1996 to acquire more information.

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield
		(lbs/acre)	(lbs/acre)	(bu/acre)	(lb/acre)	(bu/acre)
1995	Rec	1	32	175	150	147
	+25				175	147
	+50				225	158
1990 to 1994	-50	3	38	175		
	Rec					
	+50					

5-year average		
Residual N	*N applied*	*Yield*
	126	134
	176	147
	226	156

Tim Johnson, Kearney County

- Location: 9 miles south and 6 miles east of Minden
- Soil Type: Detroit silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Chopped stalks
- Planting Date: June 1, 1995
- Hybrid: Pioneer 3489
- Starter: 100 lb/acre 11-50, broadcasted, March 1995
- N Application Type: 165 lb/acre anhydrous ammonia
- Herbicide: 2 lb/acre Aatrex 9-0, broadcasted at planting
  24 oz/acre Roundup, broadcasted at planting
  0.33 oz/acre Beacon, broadcasted prior to emergence
- Harvest Date: November 4, 1995

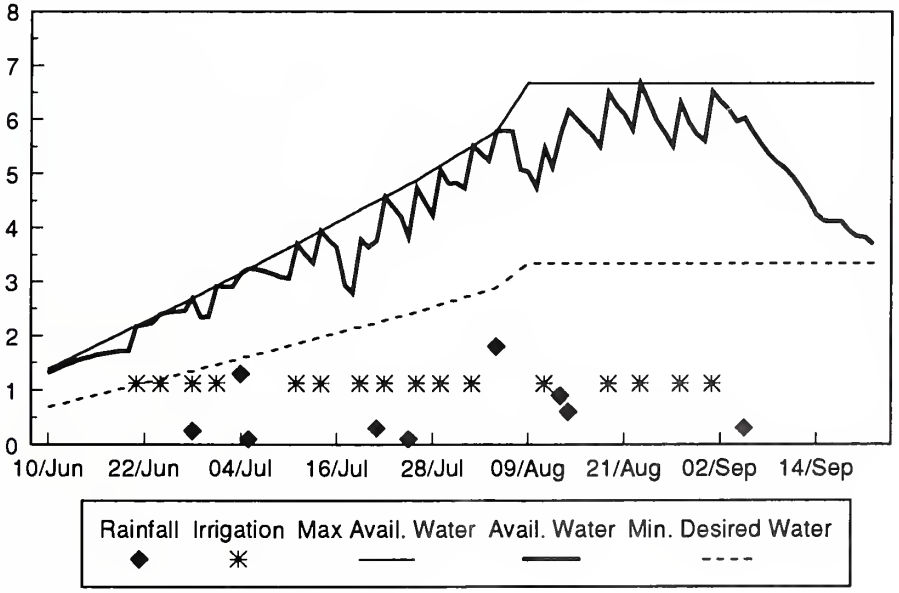
General Fertility	
pH	6.8
OM	2.5
P	17 ppm
K	402 ppm
Zn	2.70 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	1-year average		
		(lbs/acre)	(lbs/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				115	142.3		115	142.3
1995	Rec	1.0	46	190	165	146.6	46	165	146.6
	+50				215	151.3		215	151.3

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.

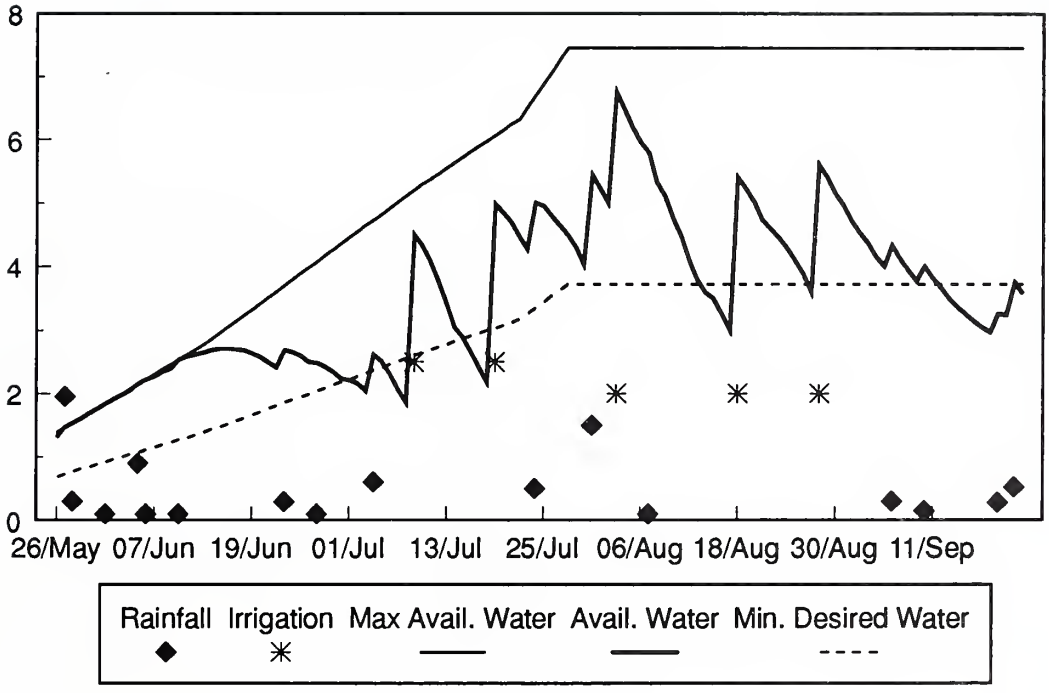


Chris Erickson, Phelps County

- Location: 3 miles east, 2 miles north and ¼ mile east of Holdrege
- Soil Type: Holdrege silt loam with a 0-1% slope
- Preceding Crop: Corn

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.


8
6
4
2
0
26/May 07/Jun 19/Jun 01/Jul 13/Jul 25/Jul 06/Aug 18/Aug 30/Aug 11/Sep
Rainfall Irrigation Max Avail. Water Avail. Water Min. Desired Water

Bill Hanson, Phelps County

- Location: 6 miles north, 2 miles west and 1 mile north of Holdrege
- Soil Type: Holdrege silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Shredded stalks, March 1995
- Planting Date: April 27, 1995
- Hybrid: Pioneer 3162
- Starter: 5 gal/acre 32-0-0 banded with herbicide at planting
- N Application Type: 165 lb/acre anhydrous ammonia, April 10, 1995
- Herbicide: 1.2 pt/acre Bicep II, banded at planting
- Harvest Date: October 27, 1995

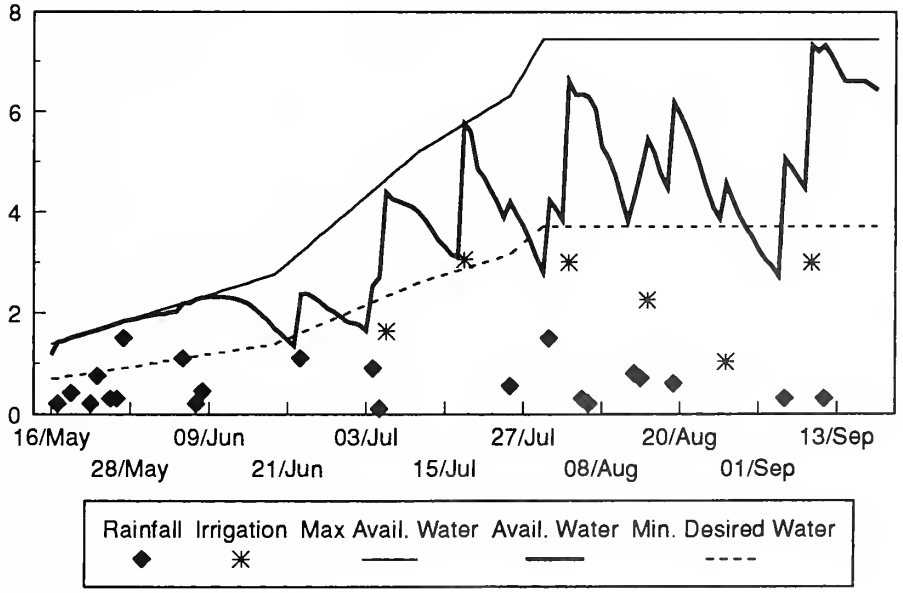
General Fertility	
pH	6.4
OM	2.4%
P	11 ppm
K	372 ppm
Zn	1.40 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	1-year average		
		(lbs/acre)	(lbs/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				115	158		115	158
1995	Rec	2	32	180	165	166	32	165	166
	+50				215	165		215	165

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Bill Harris, Phelps County

- Location: 6 miles north and 4½ miles west of Holdrege
- Soil Type: Holdrege silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Shredded stalks, November 1994
- Planting Date: April 30, 1995, May 11, 1995
- Hybrid: DK742W
- Starter: 77 lb/acre 32-0-0, sidedressed, June 24, 1995
- N Application Type: 20 lb/acre 32-0-0. broadcasted May 16, 1995
- Herbicide: 1.5 pt/acre low volume 2-4-D, broadcasted, May 16, 1995
  0.39 oz/acre Exceed + 0.39 oz/acre Accent, banded, June 25, 1995
- Insecticide: 1 bag Germote + to 1 bag of corn at plantings
  1.5 pt/acre Penncap, 2 oz/acre Pounce, August 11, 1995
- Harvest Date: October 30, 1995

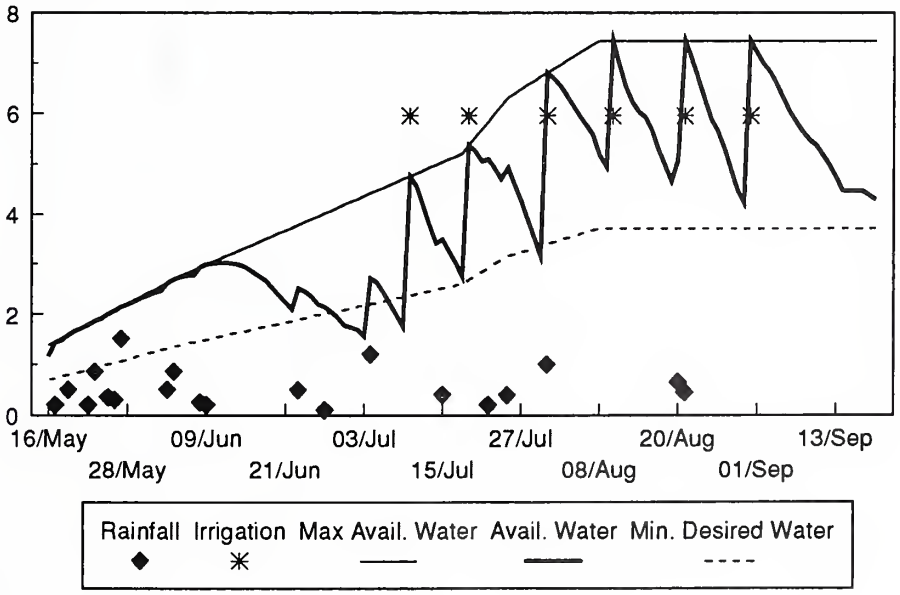
General Fertility	
pH	6.0
OM	2.9%
P	55 ppm
K	425 ppm
Zn	3.55 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	1-year average		
		(lbs/acre)	(lbs/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-40				40	126		40	126
1995	Rec	1	136	180	75	129	136	75	129
	+40				110	136		110	136

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.

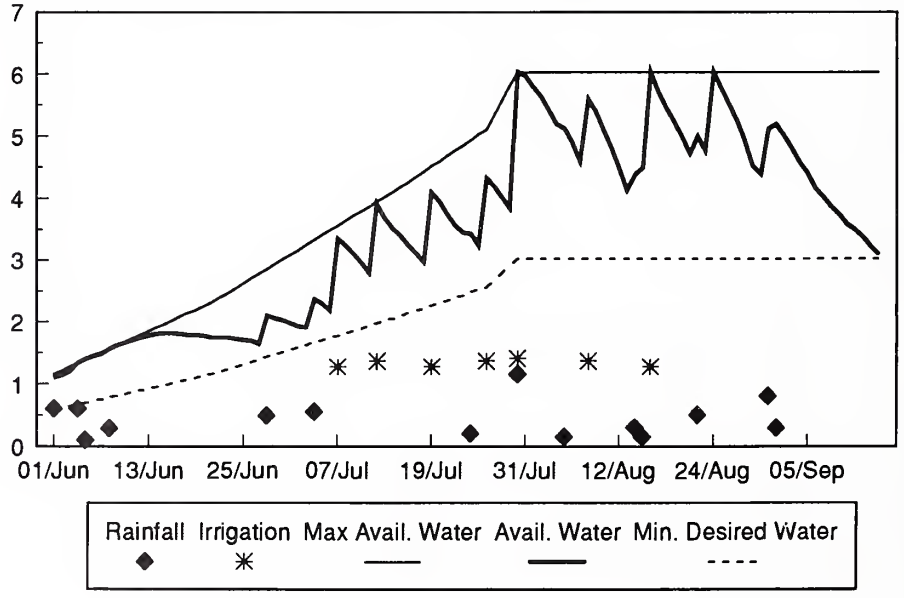


Colin Petersen, Polk County

- Location: 2 miles south and 4½ miles east of Stromsburg
- Soil Type: Hastings silt loam
- Preceding Crop: Corn
- Preplant Soil Prep: Shredded stalks
- Planting Date: May 19, 1995
- Hybrid: Pioneer 3394
- Starter: 28 lb/acre 28-0-0
- N Application Type: 160 lb/acre anhydrous ammonia
- Herbicide: 1 pt/acre Roundup, broadcasted, April 24, 1995
  1 qt/acre Bicep, banded at planting
- Insecticide: 7 lb/acre Force, in furrow at planting
  2.5 lb/acre Dipel, in whorl, July 1, 1995
- Harvest Date: October 30, 1995

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Special project—variable rate N application

Colin Petersen conducted a variable rate nitrogen application demonstration in 1995 in cooperation with the Great Plains Coop in Benedict and the University of Nebraska South Central Research and Extension Center. He conducted a similar trial in 1994.

Great Plains Coop personnel collected soil samples in the spring of 1995. On Colin's 43-acre site, they sampled soil using an alternating grid pattern every 400 feet down the row and every 96 feet (32 rows) across the field. The soil was analyzed for organic matter in the top 8 inches and residual nitrate to a depth of 3 feet.

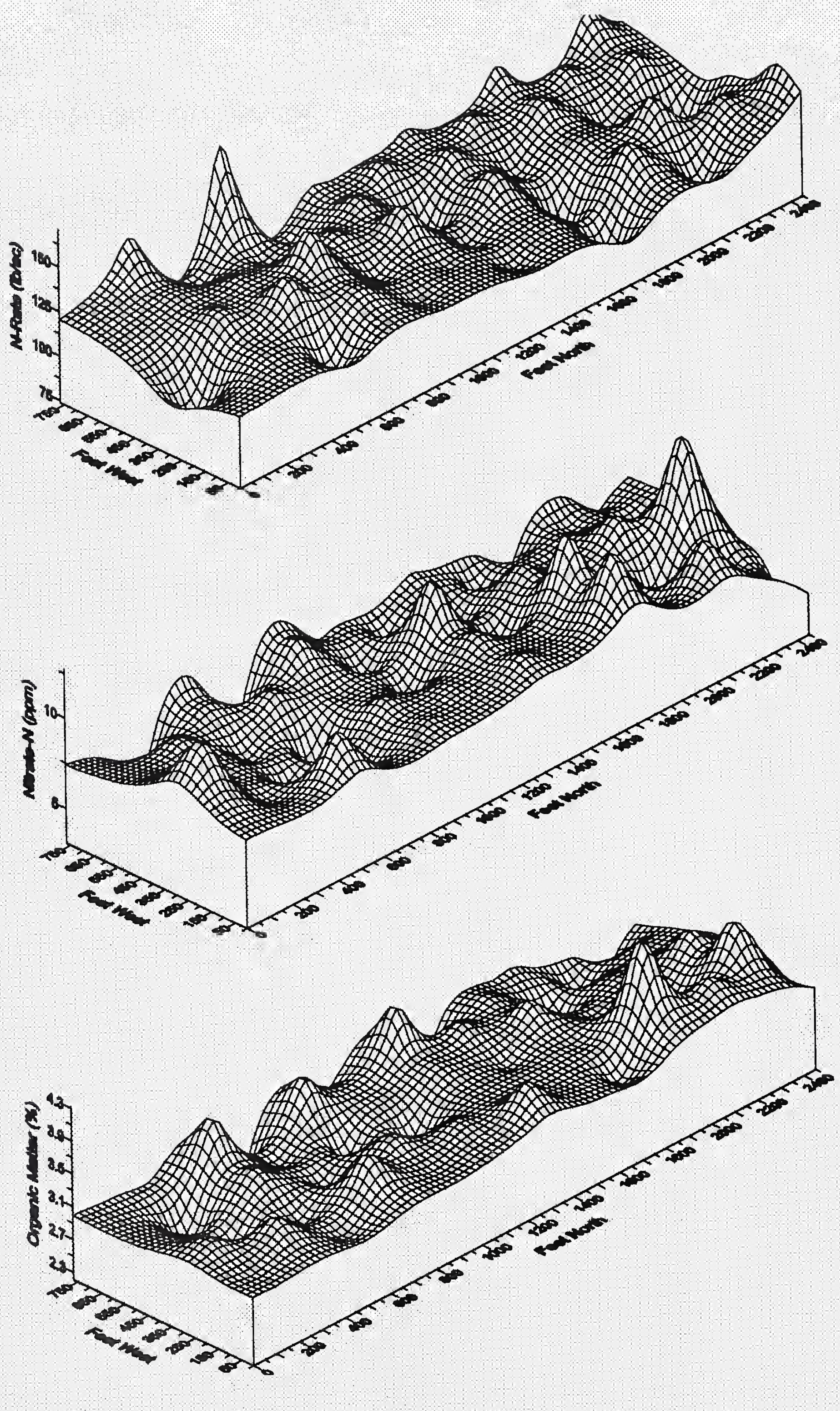
Colin conducted 2 nitrogen treatments on his site (fixed N rate, variable N rate) applied to 8 replications of field-length strips. All nitrogen was applied preplant.

He used the UNL nitrogen recommendation algorithm for corn to calculate nitrogen rates. The fixed rate treatments were based on a yield goal of 180 bushels per acre, an average 7.7 ppm soil nitrate-nitrogen and 3.0% soil organic matter. Variable rate treatments were based on an average 180 bushel-per-acre yield, and site-specific residual nitrate and organic matter.

Results:

Soil organic matter, residual nitrate and nitrogen recommendation rate maps are shown on the following page. There was no significant effect of treatment on grain yield with both treatments producing 138 bushels per acre. On average, 24 pounds per acre less nitrogen was applied to the variable rate strips compared to the fixed rate strips.

Treatment	Average total N applied (lb/acre)	Variable rate range (lb/acre)	Grain yield (bu/acre)
Fixed	126		137.9
Variable	102	77 to 131	138.3


N-Rate (lb/ac)
Feet North
Feet West
Nitrate-N (ppm)
Feet North
Feet West
Organic Matter (%)
Feet North
Feet West

Summary

Nitrogen application results from this demonstration site are consistent with observations at most other variable nitrogen rate research and demonstration sites. The total N applied was less with variable rate application. These results suggest variable rate-applied nitrogen may be more efficient than uniform-applied nitrogen. The economic and environmental influences of variable rate nitrogen application are uncertain at this point. The costs currently associated with annual intensive grid soil sampling are greater than any savings using variable treatment compared to uniform treatment.

Yield results from Colin's demonstration site are consistent with most other variable nitrogen rate research sites in that there were no yield differences between variable and fixed nitrogen application.

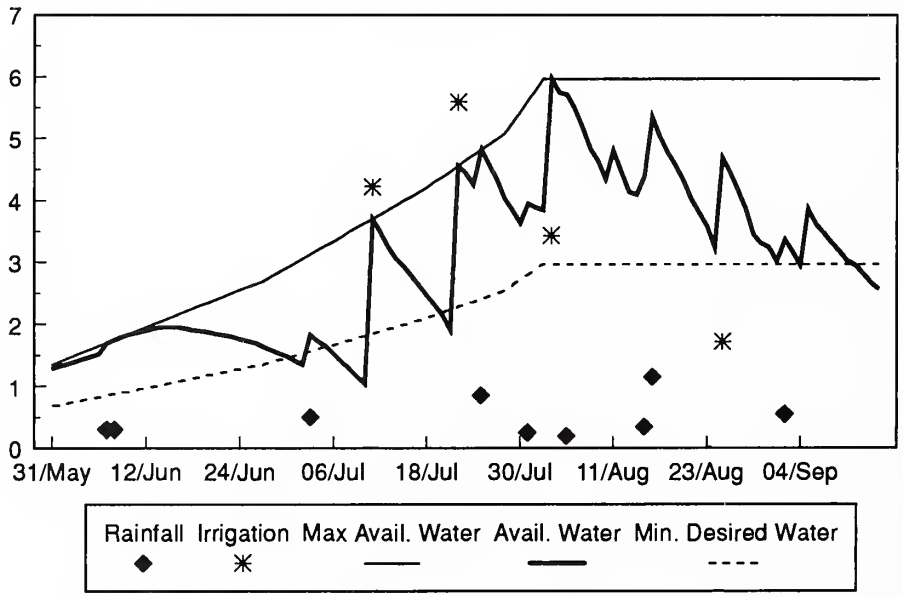
Researchers currently are evaluating the grid density required to adequately predict nitrogen rate, as well as ways to generate nitrogen recommendation maps without intensive soil sampling. Researchers also are studying the potential for variable rate nitrogen application to reduce residual nitrate in soil. If they can significantly reduce leached N using variable rate application, the practice may be beneficial even with no substantial changes in yield or total applied nitrogen.

Doug Cast, Seward County

- Location: 2 miles south and 1 mile east of Utica
- Soil Type: Fillmore silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Harrowed
- Planting Date: May 17, 1995
- Hybrid: NC+ 5037
- Starter: 5 gal/acre 10-34-0
- N Application Type: 180 lb/acre anhydrous ammonia
- Herbicide: 3.6 qt/acre Extrazine, broadcasted at planting
- Insecticide: 6 oz/1000 ft Counter

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Larry Naber, Seward County

- Location: 1¾ miles north of Utica
- Soil Type: Fillmore silt loam
- Preceding Crop: Corn
- Preplant Soil Prep: Disked and Harrowed
- Planting Date: May 18, 1995
- Hybrid: NK 7580
- N Application Type: Anhydrous ammonia
- Herbicide: 2 pt/acre Harness, banded
  0.88 oz/acre Exceed, broadcasted, June 23, 1995
- Insecticide: 8.7 lb/acre Force, banded
  Pounce, aerial, July 12, 1995
- Harvest Date: October 28, 1995

General Fertility	
pH	6.3
OM	2.7%
P	63 ppm
K	350 ppm
Zn	1.50 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	1-year average		
		(lbs/acre)	(lbs/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				60	151		60	151
1995	Rec	3	71	190	110	145	71	110	145
	+50				160	147		160	147

Leroy Voss, Thayer County

- Location: 2½ miles west of Bruning
- Soil Type: Crete silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Shredded stalks April 15, 1995
- Planting Date: April 25, 1995
- Hybrid: Pioneer 3162 IR
- Starter: amounts ranged from none to 12 gal/acre
  10-34-0 or 28-0-0
- N Application Type: 180 lb/acre anhydrous ammonia, November 1994
- Herbicide: 2.5 pt/acre Surpass 100, banded at planting
  0.88 oz/acre Exceed, broadcasted, May 20, 1995
- Harvest Date: October 18, 1995

General Fertility	
pH	6.6
OM	3.2%
P	28 ppm
K	363 ppm
Zn	3.45 ppm

Special project—effect of different starter programs

Leroy Voss was interested in seeing the effect of different starter fertilizer treatments when adequate levels of nutrients were already available in the soil. Leroy applied 180 pounds of anhydrous ammonia preplant. Soil samples taken from the field showed that the field required no other nutrients to achieve the 170-bushel yield goal based on University of Nebraska recommendations.

The demonstration consisted of four treatments, replicated three times. The treatments were 12 gallons of 28-0-0, 12 gallons of 10-34-0, a combination of 6 gallons each of 28-0-0 and 10-34-0, and no starter fertilizer. All treatments were placed in a two-by-two band at planting. There was no significant difference in yield between treatments. The harvest results are shown in the table. The trial will continue in 1996 using the same strips, and Leroy will monitor nutrient levels in the no-treatment strips.

Treatment	% Moisture	Adjusted Yield (15.5%)
12 gal. 28-0-0	20.0	149.6
12 gal 10-34-0	19.5	150.0
6 gal 28-0-0, 6 gal 10-34-0	19.6	155.7
No starter	19.5	149.7

Kevin Karr, Webster County

- Location: ½ mile north of Bladen
- Soil Type: Hastings silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Shredded stalks, March 1995
- Planting Date: May 15, 1995
- Hybrid: Pioneer 3162
- Starter: 5 gal/acre 10-34-0, placed in furrow at planting
- N Application Type: 150 lb/acre anhydrous ammonia, knifed, April 1, 1995
- Herbicide: 2 qt/acre Harness Extra and 0.33 pt/acre 2-4 D, broadcasted
  May 20, 1995
  Spot sprayed Beacon, June 20, 1995
- Insecticide: Pounce, aerial applied, August 7, 1995
  Penncap, aerial applied, August 29, 1995
- Harvest Date: October 27, 1995

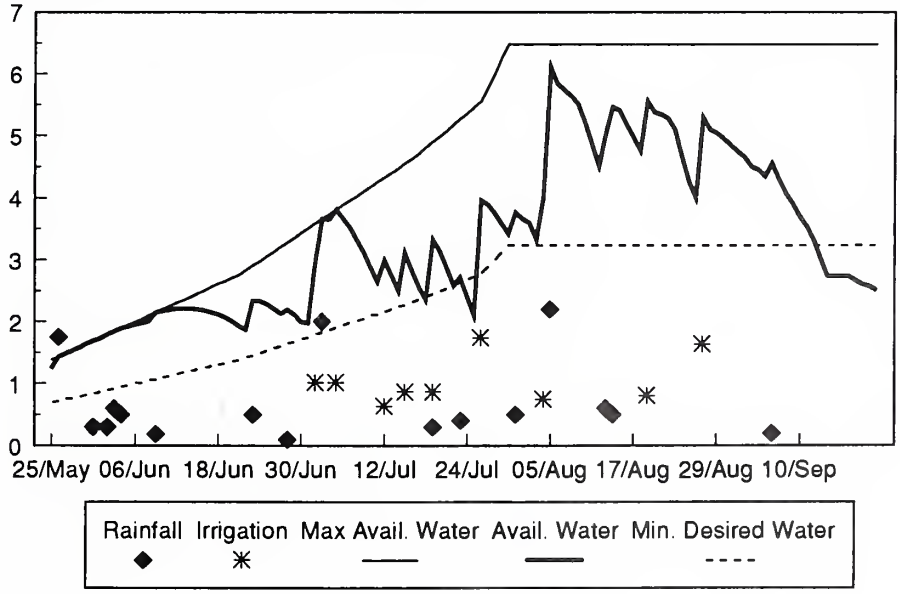
General Fertility	
pH	6.6
OM	2.4
P	14 ppm
K	344 ppm
Zn	.71 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	5-year average		
		(lbs/acre)	(lbs/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				100	156	73	89	168
1995	Rec	4	43	175	150	164	71	139	176
	+50				200	167	104	189	181

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.

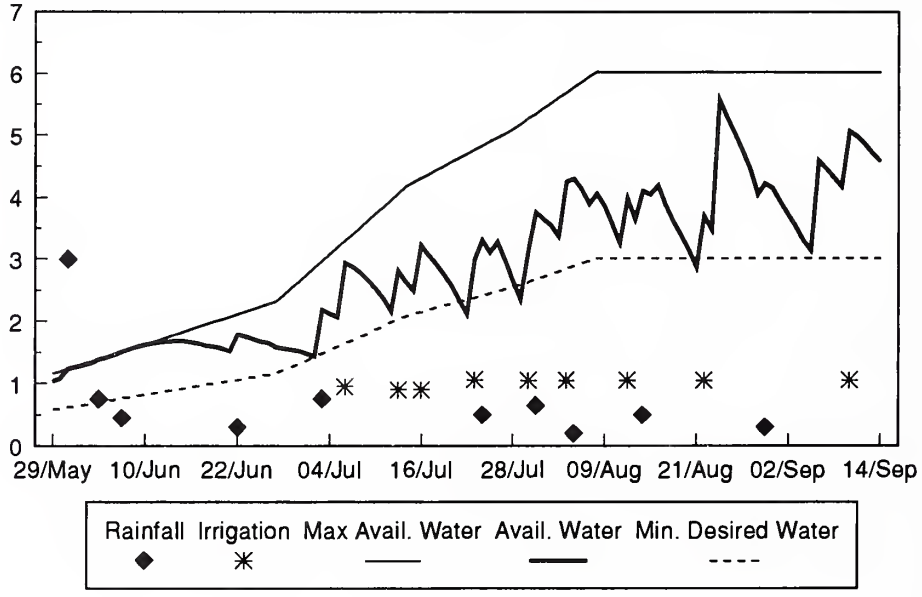


Dave Doremus, York County

- Location: 1 mile south, and 3 miles west of Benedict
- Soil Type: Hastings silt loam
- Preceding Crop: Corn
- Preplant Soil Prep: Disked
- Planting Date: May 16, 1995
- Hybrid: NK 7590
- Herbicide: 1 qt/acre Guardsman
- Insecticide: 7.3 lb/acre Force

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Special project—variable rate N application

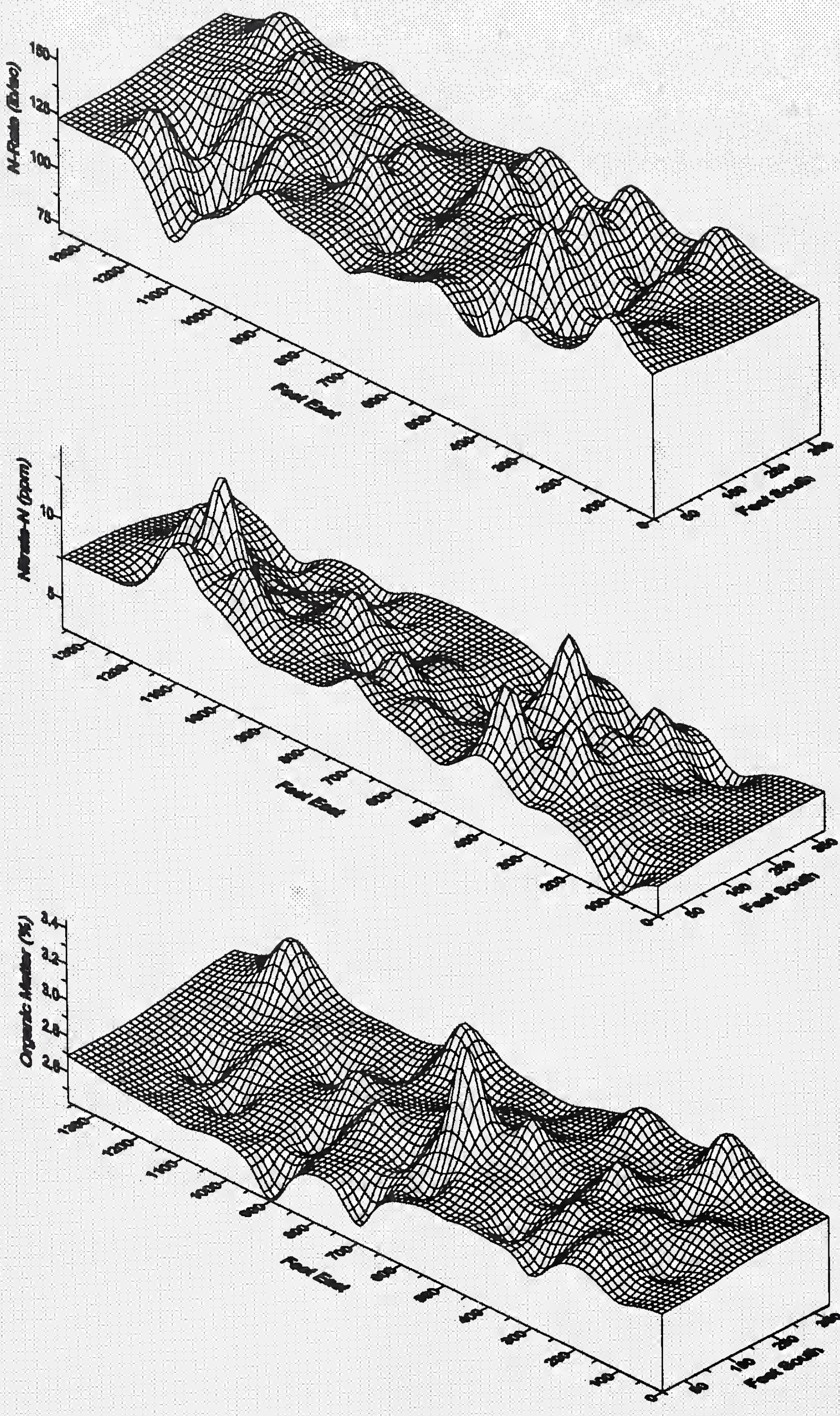
David Doremus conducted a variable rate nitrogen application demonstration in 1995 in cooperation with the Great Plains Coop in Benedict and the University of Nebraska South Central Research and Extension Center. He conducted a similar trial in 1994.

Great Plains Coop personnel collected soil samples in the spring of 1995. On Dave's 12-acre site, they sampled soil using an alternating grid pattern every 200 feet down the row and every 48 feet (16 rows) across the field. The soil was analyzed for organic matter in the top 8 inches and residual nitrate to a depth of 3 feet.

Dave conducted 4 nitrogen treatments on his site (fixed N rate, variable N rate, fixed preplant N rate plus sidedress, variable N rate plus sidedress) applied to 4 replications of field-length strips. The preplant variable N-plus-sidedress application rates were reduced by 30 pounds of nitrogen per acre. All preplant fertilizer was applied by UNL personnel using an anhydrous ammonia rig capable of varying nitrogen rates across the field.

He used the UNL nitrogen recommendation algorithm for corn to calculate nitrogen rates. The fixed rate treatments were based on a yield goal of 180 bushels per acre, an average 6.4 ppm soil nitrate-nitrogen and 2.8% soil organic matter. Variable rate treatments were based on an average 180 bushel-per-acre yield, and site-specific residual nitrate and organic matter. All treatments were reduced by 15 pounds N per acre because Dave applies liquid starter fertilizer at planting. An additional 30 pounds of N per acre was subtracted from those strips which would later be sidedressed.

Treatment	Average total N applied (lb/acre)	Variable rate range (lb/acre)	Grain yield (bu/acre)
Fixed	134		150.1
Variable	116	70 to 150	144.9
Fixed + sidedress	132		146.6
Variable + sidedress	112	70 to 150	146.9


N-Rate (lb/ac)
Feet East
Feet South
Nitrate-N (ppm)
Feet East
Feet South
Organic Matter (%)
Feet East
Feet South

Results:

Soil organic matter, residual nitrate and nitrogen recommendation rate maps are shown on the preceeding page. The average amount of nitrogen applied with the fixed N rate treatment was significantly higher than the variable N treatments. On average 18 to 20 pounds per acre less nitrogen was used when applied on a variable basis. However, the fixed N rate treatment produced a significantly greater yield than all the other treatments (3.2 to 5.2 yield advantage). Apparently there was a degree of nitrogen stress due various environmental factors, including a very wet spring, which delayed planting, and an early freeze on Sept. 22, 1995.

Summary

Nitrogen application results from this demonstration site are consistent with observations at most other variable nitrogen rate research and demonstration sites. The total N applied was less with variable rate application. These results suggest variable rate-applied nitrogen may be more efficient that uniform-applied nitrogen. The economic and environmental influences of variable rate nitrogen application are uncertain at this point. The costs currently associated with annual intensive grid soil sampling are greater than any savings using variable treatment compared to uniform treatment.

Nevertheless, contrary to results of most studies, fixed nitrogen application at Dave's site outyielded the other treatments, including the strips which were applied both fixed preplant and supplemental sidedress applications.

Researchers currently are evaluating the grid density required to adequately predict nitrogen rate, as well as ways to generate nitrogen recommendation maps without intensive soil sampling. Researchers also are studying the potential for variable rate nitrogen application to reduce residual nitrate in soil If they can significantly reduce leached N using variable rate application, the practice may be beneficial even with no substantial changes in yield or total applied nitrogen.

Brian Janzen, York County

- Location: 3 miles south and 3½ miles east of Henderson
- Soil Type: Hastings silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Rolling chopped
- Planting Date: May 16, 1995
- Hybrid: Pioneer 3225
- N Application Type: 135 lb/acre anhydrous ammonia
- Herbicide: 1 qt/acre Harness + 0.5 lb/acre Atrazine, banded at planting
  1 oz/acre Exceed, spot sprayed, June 17, 1995
- Insecticide: 5 lb/acre Lorsban
- Harvest Date: October 19, 1995

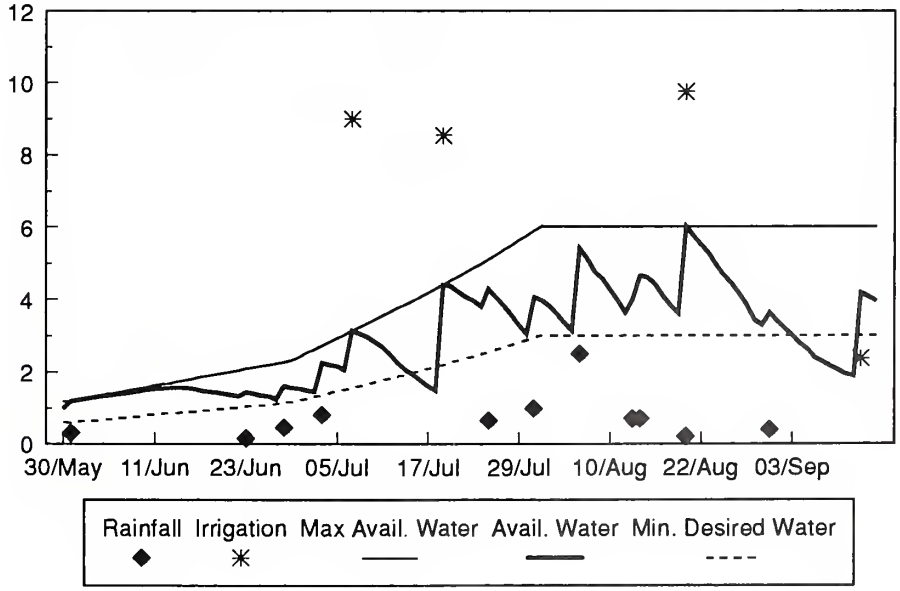
General Fertility	
pH	6.4
OM	2.8%
P	15 ppm
K	382 ppm
Zn	.33 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	4-year average		
		(lbs/acre)	(lbs/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				80	138	52	106	143
1995	Rec	7	53	170	130	149	55	156	148
	+50				180	146	88	206	148

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Brad Rathje, York County

- Location: 1 mile west of Waco
- Soil Type: Hastings silt loam with a 0-1% slope
- Preceding Crop: Corn
- Planting Date: May 19, 1995
- Hybrid: Ciba Seeds 4494
- Starter: 7 lb/acre 10-30-0-1Zn
- N Application Type: 110 lb/acre, sidedressed, June 24, 1995
- Herbicide: 1.25 pt/acre Dual II, 1.11 lb/acre Bladex DF, 1 pt/acre Atrazine 4L, 1 qt/acre crop oil in a 15" band at planting
  1.5 pt/acre Marksman in a 15" band, `June 3, 1995
- Insecticide: 1.5 pt/acre Pencapp, August 8, 1995
  2.0 pt/acre Penncap, August 18, 1995
- Harvest Date: October 23, 1995

General Fertility	
pH	5.7
OM	2.9%
P	17 ppm
K	324 ppm
Zn	1.51 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	6-year average		
		(lbs/acre)	(lbs/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				65	145	35	113	161
1995	Rec	1	104	200	115	155	55	163	163
	+50				165	159	51	213	166

Jerry Stahr, York County, Pivot

- Location: 3 miles east of the York at the junction of Highways 81 and 34
- Soil Type: Hastings silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Shredded stalks
- Planting Date: May 15, 1995
- Hybrid: Golden Harvest 2564
- N Application Type: 115 lb/acre anhydrous ammonia, November 1994
  15 lb/acre 28-0-0 at cultivation, August 2, 1995
- Herbicide: 1 qt/acre Dual II, May 14, 1995
  1 oz/acre Exceed, spot sprayed, May 28, 1995
- Harvest Date: October 18, 1995

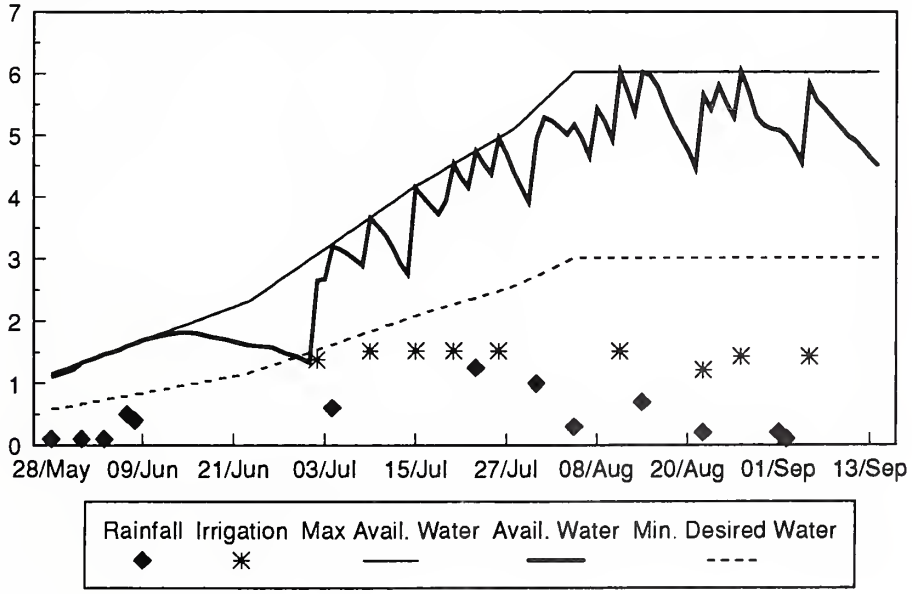
General Fertility	
pH	6.1
OM	2.9%
P	21 ppm
K	324 ppm
Zn	.95 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	5-year average		
		(lbs/acre)	(lbs/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				80	170	33	116	169
1995	Rec	12	54	185	130	177	48	166	173
	+50				180	179	37	216	174

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Jerry Stahr, York County, Gravity

- Location: 1½ miles east of the York at the junction of Highways 81 and 34
- Soil Type: Hastings silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Shredded stalks
- Planting Date: May 16, 1995
- Hybrid: Golden Harvest 2564
- N Application Type: 105 lb/acre anhydrous ammonia, November 1994
  15 lb/acre 28-0-0 at cultivation, August 5, 1995
- Herbicide: 1 qt/acre lasso, banded at planting
  1 pt/acre Buctril + 1 pt/acre atrazine, broadcasted, June 5, 1995
- Harvest Date: October 20, 1995

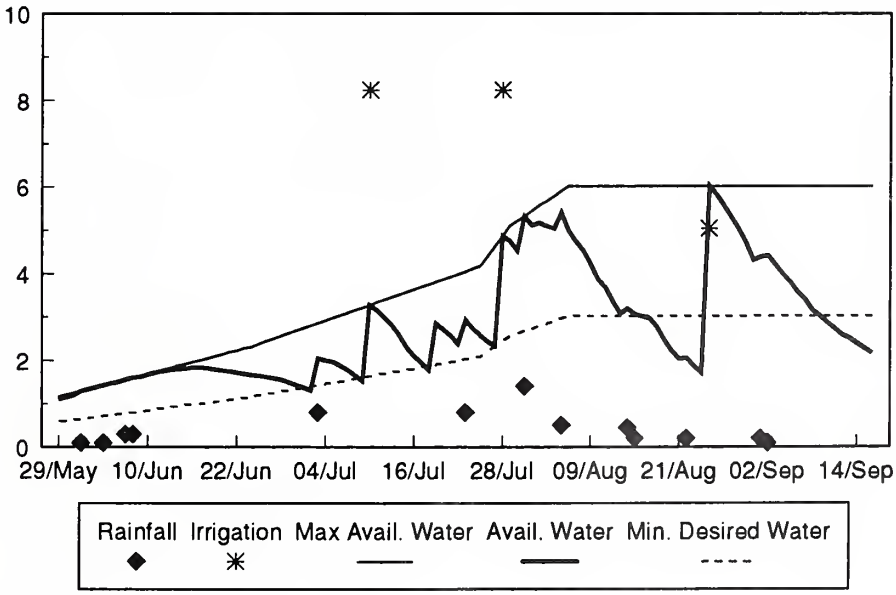
General Fertility	
pH	6.1
OM	3.4%
P	14 ppm
K	379 ppm
Zn	.58 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	5-year average		
		(lbs/acre)	(lbs/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				70	151	42	104	160
1995	Rec	14	57	185	120	161	58	154	168
	+50				170	160	54	204	168

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Ron Uffelman, York County

- Location: 3 miles east and 2¼ miles south of Waco
- Soil Type: Hastings silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Shredded stalks
- Planting Date: May 17, 1995
- Hybrid: Golden Harvest 9581
- N Application Type: 95 lb/acre anhydrous ammonia, March 28, 1995
  12 gal/acre 28-0-0 at cultivation, June 19, 1995
  8 gal/acre 28-0-0 at hilling, July 1, 1995
- Herbicide: 3 pt/acre Lariat, banded at planting
  1.5 pt/acre Buctril/Atrazine, broadcasted, June 12, 1995
- Harvest Date: October 25, 1995

General Fertility	
pH	5.6
OM	2.7%
P	68 ppm
K	412 ppm
Zn	1.21 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	2-year average		
		(lbs/acre)	(lbs/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				105	166			
1995	Rec		61	200	155	173	92	78	209
	+50				205	173		128	209
	Rec		123	200	0	244			
1994	+50				50	245			
	+100				100	245			

Who to contact in your area for more information...

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Jerry Stahr, RR 2 Box 75, York, NE 68467, 402/362-2574
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